SYLLABUS

FOR

Bachelor of Vocational Degree, Advance Diploma and Diploma

(Food Science and Technology)

Under

UGC's National Skill Qualification Framework (NSQF)

At

PDEA's
Prof. Ramkrishna More Arts, Commerce College
Akurdi, Pune (Maharashtra)

Affiliated

To

University of Pune.

YEAR 2020-2021

Proposed subjects / papers in the Skill component and General Education component in each of the three years.

Course Structure for F. Y. B. Voc. (Food Science & Technology) 2020-2021

Sr. No.	Code No.	Name of the Paper	Credits	Marks
I	**Semester I**			
	General education component			
1.	**FST 11**	Basic Principles of Food Preparation & Preservation	**3**	**75**
2.	**FST 12**	Basic Nutrition I	**3**	**75**
3.	**FST 13**	Introduction to Food Science	**3**	**75**
4.	**FST 14**	Basics of Food Microbiology	**3**	**75**
	(Skill Component)			
5.	**FST 15**	Practical Paper I	**4**	**100**
6.	**FST 16**	Practical paper II	**4**	**100**
7.	**FST 17**	Practical paper III	**4**	**100**
8.	**FST 18**	Seminar	**2**	**50**
9.	**FST 19**	On Job Training (Internship)	**4**	**100**
	Total		**30**	**750**
II	**Semester II**			
	General education component			
1.	**FST 21**	Food Microbiology-II	**3**	**75**
2.	**FST 22**	Food Chemistry	**3**	**75**
3.	**FST 23**	Introduction to Food Science II	**3**	**75**
4.	**FST 24**	Food Adulteration	**3**	**75**
	Practical (Skill Component)			
5.	**FST 25.**	Practical paper IV	**4**	**100**
6.	**FST 26.**	Practical paper V	**4**	**100**
7.	**FST 27.**	Practical Paper VI	**4**	**100**
8.	**FST 28.**	Seminar	**2**	**50**
9.	**FST 29.**	On Job Training (Internship)	**4**	**100**
	Total		**30**	**750**

GUIDELINES FOR INTRODUCTION OF BACHELOR OF VOCATION (B.VOC.) PROGRAMME IN UNIVERSITIES AND COLLEGES UNDER THE NATIONAL SKILLS QUALIFCATIONS FRAMEWORK (NSQF)

1. Introduction

It has been a long felt necessity to align higher education with the emerging needs of the economy so as to ensure that the graduates of higher education system have adequate knowledge and skills for employment and entrepreneurship. The higher education system has to incorporate the requirements of various industries in its curriculum, in an innovative and flexible manner while developing a holistic and well groomed graduate.

Ministry of HRD, Government of India had issued an Executive Order in September 2011 for National Vocational Education Qualification Framework (NVEQF). Subsequently, Ministry of Finance, in pursuance of the decision of Cabinet Committee on Skill Development in its meeting held on 19th December, 2013, has issued a notification for National Skills Qualifications Framework (NSQF) which supersedes NVEQF.

Under the National Skills Development Corporation, many Sector Skill Councils representing respective industries have/are being established. One of the mandates of Sector Skill Councils is to develop National Occupational Standards (NOSs) for various job roles in their respective industries. It is important to embed the competencies required for specific job roles in the higher education system for creating employable graduates.

The University Grants Commission (UGC) has launched a scheme on skills development based higher education as part of college/university education, leading to Bachelor of Vocation (B.Voc.) Degree with multiple exits such as Diploma/Advanced Diploma under the NSQF. The B.Voc. programme is focused on universities and colleges providing undergraduate studies which would also incorporate specific job roles and their NOSs along with broad based general education. This would enable the graduates completing B.Voc. to make a meaningful participation in accelerating India's economy by gaining appropriate employment, becoming entrepreneurs and creating appropriate knowledge.

2. Objectives

2.1 To provide judicious mix of skills relating to a profession and appropriate content of General Education.

2.2 To ensure that the students have adequate knowledge and skills, so that they are work ready at each exit point of the programme.

2.3 To provide flexibility to the students by means of pre-defined entry and multiple exit points.

2.4 To integrate NSQF within the undergraduate level of higher education in order to enhance employability of the graduates and meet industry requirements. Such graduates apart from meeting the needs of local and national industry are also expected to be equipped to become part of the global workforce.

2.5 To provide vertical mobility to students coming out of 10+2 with vocational subjects.

3. Levels of Awards

The certification levels will lead to Diploma/Advanced Diploma/B. Voc. Degree in one or more vocational areas and will be offered under the aegis of the University.

Award	**Duration**	**Corresponding NSQF level**
Diploma	1 Year	5
Advanced Diploma	2 Years	6
B.Voc. Degree	3 Years	7

4. Eligibility /Target

All universities and colleges included under Sections 2(f) and 12(B) of the UGC Act, 1956 and receiving plan grant from the UGC are eligible for UGC financial assistance under the scheme.

5. Eligibility for admission in B.Voc.

The eligibility condition for admission to B.Voc. programme shall be 10+2 or equivalent, in any stream.

6. Curriculum

The curriculum in each of the years of the programme would be a suitable mix of general education and skill development components. Curriculum details should be worked before introduction of the courses.

7. Guidelines for credit calculations

7.1 This section contains credit framework guidelines. The university/ college should use these guidelines or adapt them.

7.2 The following formula should be used for conversion of time into credit hours.

a) One Credit would mean equivalent of 15 periods of 60 minutes each, for theory, workshops/labs and tutorials;
b) For internship/field work, the credit weightage for equivalent hours shall be 50% of that for lectures/workshops;
c) For self-learning, based on e-content or otherwise, the credit weightage for equivalent hours of study should be 50% or less of that for lectures/workshops.

7.3 The suggested credits for each of the years are as follows:

NSQF Level	**Skill Component Credits**	**General Education Credits**	**Normal calendar duration**	**Exit Points / Awards**
Year 3	36	24	Six Semesters	B.Voc.
Year 2	36	24	Four semesters	Advanced Diploma
Year 1	36	24	Two semesters	Diploma
TOTAL	**108**	**72**		

8. Examination and Assessment

8.1. The assessment for the general education component would be done by the university as per their prevailing standards and procedures.

8.2. The assessment for the skill development components would necessarily focus on practical demonstrations of the skills acquired.

The university has to necessarily establish a credit based assessment and evaluation system for the B.Voc. programme.

PDEA'S

Prof. Ramkrishna More ACS College Akurdi, Pune

Department of B. Voc. Food Science and Technology

Proposed Syllabus for the Academic Year 2020-21

Teaching and Examination Scheme for F. Y. B. Voc. (Food Science & Technology)

Semester-I				**Marks**		
Paper Code	**Title**	**No. of credits**	**Hrs. /week**	**Internal (CIA)**	**External (ESE)**	**Total**
	Semester I					
	General education component					
FST 11	Basic Principles of Food Preparation & Preservation.	**3**	**3**	**35**	**40**	**75**
FST 12	Basic Nutrition I.	**3**	**3**	**35**	**40**	**75**
FST 13	Introduction to Food Science-I	**3**	**3**	**35**	**40**	**75**
FST 14	Basics of Microbiology.	**3**	**3**	**35**	**40**	**75**
	Skill Component					
FST 15	Practical Paper I	**4**	**4**	**50**	**50**	**100**
FST 16	Practical paper II	**4**	**4**	**50**	**50**	**100**
FST 17	Practical paper III	**4**	**4**	**50**	**50**	**100**
FST 18	Seminar.	**2**	**2**	**25**	**25**	**50**
FST 19	On Job Training (Internship).	**4**	**4**	**50**	**50**	**100**
	Total	**30**		**365**	**385**	**750**
	Semester II					
	General education component					
FST 21	Food Microbiology	**3**	**3**	**35**	**40**	**75**
FST 22	Food Chemistry	**3**	**3**	**35**	**40**	**75**

FST 23	Introduction to Food Science II	**3**	**3**	**35**	**40**	**75**
FST 24	Food Adulteration	**3**	**3**	**35**	**40**	**75**
	Practical (Skill Component)					
FST 25	Practical Paper III	**4**	**4**	**50**	**50**	**100**
FST 26.	Practical paper IV	**4**	**4**	**50**	**50**	**100**
FST 27.	Practical Paper V	**4**	**4**	**50**	**50**	**100**
FST 28.	Seminar	**2**	**2**	**25**	25	**50**
FST 29.	On Job Training (Internship)	**4**	4	**50**	**50**	**100**

B. Voc. Food Processing and Technology
Proposed Syllabus of Three Years
Name of Subjects/Papers

- **F.Y. B.Voc.**

Sr. No.	Code No.	Name of the Paper	Credits	Marks
I	**Semester I**			
	General education component			
1.	**FST 11**	Basic Principles of Food Preparation & Preservation	**3**	**75**
2.	**FST 12**	Basic Nutrition I	**3**	**75**
3.	**FST 13**	Introduction to Food Science	**3**	**75**
4.	**FST 14**	Basics of Food Microbiology	**3**	**75**
	Practical (Skill Component)			
5.	**FST 15**	Practical Paper I	**4**	**100**
6.	**FST 16**	Practical paper II	**4**	**100**
7.	**FST 17**	Practical paper III	**4**	**100**
8.	**FST 18**	Seminar	**2**	**50**
9.	**FST 19**	On Job Training (Internship)	**4**	**100**
	Total		**30**	**750**

II	**Semester II**			
	General education component			
	FST 21	Food Microbiology-II	**3**	**75**
	FST 22	Food Chemistry	**3**	**75**
	FST 23	Introduction to Food Science II	**3**	**75**
	FST 24	Food Adulteration	**3**	**75**
	Practical (Skill Component)			
	FST 25.	Practical paper IV	**4**	**100**
	FST 26.	Practical paper V	**4**	**100**
	FST 27.	Practical Paper VI	**4**	**100**
	FST 28.	Seminar	**2**	**50**
	FST 29.	On Job Training (Internship)	**4**	**100**
	Total		**30**	**750**

- **S.Y. B.Voc.**

Sr. No.	**Semester**	**Name of the Paper**	**Credits**	**Marks**
I	**Semester III (Credits 30)**			
	Theory Paper			
1.	**FST 31.**	Introduction to Food Science II	**3**	75
2.	**FST 32.**	Basic Nutrition II	**3**	75
3.	**FST 33.**	Techniques in Food analysis.	**3**	75
4.	**FST 34.**	Food Processing Technology	**3**	75
	Practical (Skill Component)			
5.	**FST 35.**	Practical Paper VII	**4**	**100**
6.	**FST 36.**	Practical Paper VIII	**4**	**100**

7.	**FST 37.**	Practical Paper IX	**4**	**100**
8.	**FST 38.**	Seminar	**2**	**50**
9.	**FST 39**	On Job Training (Internship)	**4**	**100**
II	**Semester IV (Credits 30)**			
	Theory Paper			
1.	**FST 41.**	Biochemistry II	3	75
2.	**FST 42**	Food Preservation.	3	75
3.	**FST 43.**	Food informatics, Regulations and Packaging.	3	75
4.	**FST 44.**	Food Service Management	3	75
	Practical (Skill Component)			
5.	**FST 45.**	Practical Paper X	**4**	**100**
6.	**FST 46.**	Practical Paper XI	**4**	**100**
7.	**FST 47.**	Practical Paper XII	**4**	**100**
8.	**FST 48**	Seminar	**2**	**50**
9.	**FST 49.**	On Job Training (Internship)	**4**	**100**
		Total	**30**	**750**

- **T.Y.B.Voc.**

Sr. No.	**Semester**	**Name of the Paper**	**Credits**	**Marks**
I	**Semester V (Credits 30)**			
	Theory Paper			
1.	**FST51.**	Principles of food Preservation and processing.	**3**	75
2.	**FST 52.**	Dairy Science.	**3**	75
3.	**FST 53.**	Technology of Plants Foods.	**3**	75
4.	**FST 54**	Technology of Animal Foods.	**3**	75
5.	**FST 55.**	Introduction to Immunology and Allergy	**4**	100
Practical (Skill Component)				

6.	**FST 56.**	Practical Paper XIII	**4**	**100**
7.	**FST 57.**	Practical Paper XIV	**4**	**100**
8.	**FST 58.**	Seminar	**2**	**50**
9.	**FST 59.**	On Job Training (Internship)	**4**	**100**
			30	**750**
II	**Semester VI (Credits 30)**			
	Theory Paper			
1.	**FST 61.**	Technology of Spices.	**3**	**75**
2.	**FST 62**	Food Science and Quality Control	**3**	**75**
3.	**FST 63**	Nutraceuticals and Health Foods	**3**	**75**
4.	**FST 64.**	Snack Foods Technology	**3**	**75**
5.	**FST 65.**	Intercontinental foods/Recipes.	**4**	**100**
	Practical (Skill Component)			
6.	**FST 66.**	Practical Paper XV	**4**	**100**
7.	**FST 67**	Practical Paper XVI	**4**	**100**
8.	**FST 68.**	Project	**2**	**50**
9.	**FST 69.**	On Job Training (Internship)	**4**	**100**

PDEA'S Prof. Ramkrishna More College, Akurdi, Pune

B. Voc (Food Science & Technology)

Revised Syllabus – F.Y 2020-21

Paper FST 11: Basic Principles of Food Preparation & Preservation (General Education Component)

Maximum Marks: 75 **Credits: 3**
Teaching Period: 3 /week **Teaching Load: 45 Theory Period/Semester**

Objectives:

- To study methods of preservation of foods
- To develop the skills for processing of food after post-harvest and use of various preservation techniques in food processing industries

Learning Outcomes:

- Students will have a thorough understanding of various food processing techniques.
- The students will know the importance of various preservation technique

(**Content: General Paper-01**)

Unit	Topic	Details	No of Lectures
Unit 1-	**Introduction to Food Preparation**	• 1.1 Definition & Function of food • 1.2 Classification of food • 1.3 Cooking & Objectives of cooking • 1.4 Methods of Cooking- Conduction, Convection & radiation • 1.5 Microwave Cooking • 1.6 Solar Cooking • 1.7 Classification of Cooking method- Moist, Dry & Combination methods • 1.8 Changes in Cooking- Proteins, carbohydrates, lipids, vitamins & minerals, Color	9
Unit II	**Introduction**	• 2.1 Definition of preservation • 2.2 Introduction to preservation, • 2.3 History of preservation, • 2.4 General principles of food preservation. • 2.5 Need &; benefits of industrial food preservation;	9
Unit - III	**Preservation by Low Temperature**	• 3.1 Introduction of Temperatures • 3.2 Cellar Storage • 3.3 Chilling • 3.4 Refrigeration • 3.5 Dehydro Freezing • 3.6 IQF • 3.7 Freezing	9
Unit IV	**Preservation by High Temperature**	• 4.1 Pasteurization- Definition, Importance of Pasteurization, Methods of Pasteurization, types of pasteurizers. • 4.2 Sterilization- Definition, Importance, Methods of Sterilization. • 4.3 Blanching- Definition, Methods • 4.4 Aseptic Canning- Definition, Process	9

Unit V	**Food Preservation by Other Means**	• 5.1 Preservation by means of Carbonation- Introduction, Method • 5.2 Preservation by means of Antibiotics Introduction, Method • 5.3 Preservation by means of Fermentation Introduction, Method • 5.4 Preservation by means of Filtration Introduction, Method • 5.5 Preservation by means of Preservatives • 5.6 Preservation by means of Irradiation	9

Reference Books:

- Food Processing and Preservation- Subbulaksmi G., and Udipi S.
- Principles of Food Science, Vol. II- G. Borgstron, Mc. Millan Co. Ltd. London.
- Principles of food preservation Part I& II- Owen R. Fenemma.
- Food Science- Potter, CBS publishers.
- Technology of Food Preservation - N.W. Desroiser and N.W. Desrosier
- Introduction to Food Science & Technology- G.P. Stewart & M.A. Amerine
- Food Processing Operations Vol. III -M.A. Joslyn and J.J. Heild.
- Preservation of Fruits and Vegetables- Giridhari Lal, G.S. Siddappa, and G.L. Tondon
- Food Preservation- Prakash Triveni, Aadi Publication, Delhi.
- Modern Food Preservation- McWillims and Paine, Surjeet Publication.
- Food Processing and Preservation- B. Sivasankar

Paper FST 12: BASIC NUTRITION-I (General Educational Component)

Maximum Marks: 75 **Credits: 3**
Teaching Period: 3 /week **Teaching Load: 45 Theory Period/Semester**

(**Content: General Paper-02**)

Objectives:

- To understand nutrients and food component that supply nourishment to the body.
- To know about the functions, deficiency and toxicity of nutrients
- To understand malnutrition and its prevention

Learning Outcomes:

Students will be able to:

- Utilize knowledge from the physical and biological sciences as a basis for understanding the role of food and nutrients in health and disease processes.
- Provide nutrition counseling and education to individuals, groups, and communities throughout the life span using a variety of communication strategies.
- Evaluate nutrition information based on scientific reasoning for clinical, community, and food service application.

Unit	Topic	Details	No of Lectures
Unit- 1	**Introduction to Basic Nutrition**	• 1.1 Definition- Nutrition, Nutrients, Dietetics, Balance Diet, Health, Energy, Adequate Nutrition, Optimal Nutrition, Malnutrition, Under Nutrition, Over Nutrition, Phytochemicals, Prebiotics, Probiotics. Balance diet. • 1.2 Relation between health & Nutrition • 1.3 Food & its functions. • 1.4 Classification of Nutrients • 1.5 Digestion, Absorption & Metabolism of Food	9
Unit- 2	**Carbohydrates**	• 2.1 Introduction of CHO • 2.2 Functions of CHO • 2.3 Classification- Disaccharide, polysaccharides • 2.4 Food sources • 2.5 RDA • 2.6 Consequences of inadequate and excessive intakes • 2.7 Dietary fiber • 2.8 Functions of dietary fiber • 2.9 Glycemic Index • 2.10 Digestion absorption & Metabolism of Carbohydrates	9
Unit 3	**Proteins**	• 3.1 Introduction Of Protein • 3.2 Composition. • 3.3 Classification. • 3.4Functions. • 3.5 RDA. • 3.6 Food sources. • 3.7 Essential & non-essential amino acids. • 3.8 Protein deficiency & excess • 3.9 Protein quality. • 3.10Digestion absorption & Metabolism	9

Unit-4	**Lipids**	• 4.1 Introduction Of Lipids • 4.2 Composition • 4.3 Classification • 4.4 RDA • 4.5 Food sources • 4.6 Function • 4.7Consequences of inadequate & excessive intakes	9
Unit 5	**Vitamins & Minerals**	• 5.1 Introduction of Macro (Na, K, Ca, Mg, P) minerals. • 5.2 Introduction of micro mineral (Fe, I, F, Zn, Cu, Co, Se, Cr. Mn, Mo, Ni, Sn, Si, V) • 5.3 Introduction of trace elements (Pb, Hg, B, Bo, Al) • 5.4 Functions of micro, macro & trace elements. • 5.5 Food Sources & RDA. • 5.6 Deficiency & toxicity. • 5.7 Introduction of vitamins. • 5.8 Classification. • 5.9 Water soluble vitamins (Vit-B1, B2, B3, B5, B6, B7, B9, B12 & Vit-C). • 5.10 Fat soluble vitamins (Vit-A, D, E & K). • 5.11 Function. • 5.12 RDA. • 5.13 Food sources. • 5.14 Deficiency& toxicity vitamins.	9

Reference Book:

- Dr. M. Swaminathan (2006), Food Science and Nutrition II Edition, Sunetra Roday, Oxford publication Advanced text book on Food and Nutrition, Vol.I and II, Second Edition. BAPPCO Publication
- Jim Mann and A. Stewart Truswell (2010), Essentials of Human Nutrition, Third Edition: Oxford publication
- Michel J. Gibney, Hester H. Vorster and Frans J. Kok (2002), Introduction to Human Nutrition, First Indian Reprint., Blackwell Publishing.
- Begum, R. A text book of foods, Nutrition and Dietetics. Second revised edition, Sterling Publishers (P) Ltd, New Delhi, 1991.

- Chaddha R. Text boolk of nutrition: A life cycle approach. Joshi, S. A Nutrition and dietetics. Third edition, Tata McGraw Hill education pvt ltd, New Delhi, 2010
- Mudambi, S. R., Rajagopal M. V., Fundamentals of food and Nutritions, 2nd edition,Wiley Eastern Ltd, New Delhi 1990.
- Roday, S., food science and nutrition. Third edition, Oxford University Press, New Delhi, 2008.
- Srilakshmi, B, Nutrition Science, New age international (P) Ltd publishers, NewDelhi, 2006.
- Swaminathan, M., Hand book of Food & Nutrition, Bappco Ltd, Bangalore, 1978.
- Swaminathan, M. Essential of food and Nutrition, Vol.I. Bangalore Printing and
- Publishing Co. Ltd Bangalore.

Paper FST 13: Introduction to Food Science (General Educational Component)

Maximum Marks: 75 **Credits: 3**
Teaching Period: 3 /week **Teaching Load: 45 Theory Period/Semester**

Learning Objectives:

- To make students aware about various cooking methods, food groups, composition, nutritive value and effect of cooking on foods.

Learning Outcomes:

The student will be able to:

- Know about the basic cookery and the nutritive value of food products
- Classify the products according to properties
- Explain role of each food group products

Unit	Topic	Details	No of Lectures
Unit-1	**Introduction to food science**	• 1.1 Definition of Food • 1.2 Classification & Functions of foods • 1.3 Basic Five Food Groups • 1.4 Food Pyramid • 1.5 Objectives of food science	9
Unit II	**Cereals**	• 2.1 Structure • 2.2 Composition • 2.3 Nutritive value of Cereals • 2.4 Major & Minor Cereals - Structure, composition and Importance of cereal grains - Types of cereals used in cooking • 2.5 Wheat- structure and composition, types (hard, soft/ strong, weak). • 2.6 Rice- Composition of rice obtained by different de-husking methods, parboiling of rice- advantages and disadvantages. • 2.7 Millets -Varieties, composition and uses of maize, sorghum, barley, rye, oats, triticale, pearl millet and finger millet. • 2.8 Role of Cereals in Cookery • 2.9 Storage of cereal	9
Unit - III	**Pulses and Legumes**	- 3.1 Definition, Introduction, common names and scientific names of different pulses, composition and structure of pulses -3.2 Chemical composition of pulses -3.3 Cooking of Legumes and Factors Affecting cooking time of pulses and legumes **-3.4** Uses of legumes in cookery	9

Unit - IV	**Fats and Oils**	• 4.1 Introduction of fat & oil • 4.2 Nutritional importance • 4.3 Sources • 4.4 Functions • 4.5 Animal fats & plant fats • 4.6 Role of fats and oils in cookery • 4.7 Changes in fats during storage • 4.8 Prevention of fat spoilage	9
Unit- V	**Nuts**	• 5.1 Introduction of Nuts • 5.2 Classification of nuts • 5.3 Specific nuts- Cashew-nut, Coconut, groundnut, almonds, Chestnut • 5.4 Toxins in nuts • 5.5 Role of nuts in cookery	9

Reference Book:.

1. An Introduction to Food Science, Technology & Quality Management, Devendrakuma Bhatt & Priyanka Tomar :Kalyani Publishers.
2. Advanced text book on Food and Nutrition, Vol.I and II, Second Edition. Dr. M. Swaminathan (2006), BAPPCO Publication
3. Biochemistry of Foods:- N.A.M. Eskin, H.M. Henderson, R. J. Townsend.
4. Biochemistry, 2nd edition, by R.H. Garrett and C.M. Grisham (1999). Saunders college publishing, N. Y. Sons, NY.
5. Biochemistry (2004) by J. David Rawn, Panima, Publishing Corporation, New Delhi.
6. Basic Food Microbiology by G.J. Banwart
7. Commercial Rabit meat production, Portsmouth.J.I,
8. Chemistry and Technology of Oils and Fats, Chakrabarty MM. 2003.. Prentice Hall.
9. Cereal and Cereal Products Dendy , DAV & Dobraszczyk BJ. 2001.. Aspen.
10. Dairy Microbiology by E .M. Foster.
11. Dairy Processing – Improving Quality.Smit G. 2003. CRC-Woodhead Publ.
12. Dairy Technology – Principles of Milk Properties and Processes. Walstra P, Geurts TJ, Noomen A, Jellema A & Van Boekel MAJS. 1999. Marcel Dekker.
13. Egg Science & Technology Stadelmen w. J. Cotterill O. j,
14. Enzymes in Food Technology, Whitehurst and Law, CRC Press, Canada, 2002

Paper FST 14: Basic of Food Microbiology (General Educational Component)

Maximum Marks: 75 **Credits: 3**
Teaching Period: 3 /week **Teaching Load: 45 Theory Period/Semester**

Learning Objectives:
To enable the students to:

- Understand the various types of poisoning and infection caused by microorganism.
- Study various techniques used to study microorganisms.

Learning Outcomes:
Students should be able to:

- Explain the interactions between microorganisms and the food environment, and factors influencing their growth and survival.
- Explain the effects of fermentation in food production and how it influences the microbiological quality and status of the food product.
-

Objective: The basic object of this paper is to help students to acquire the knowledge of Food Microbiology			
Unit	**Topic**	**Details**	**No of Lectures**
Unit-1	**History and Scope of Microbiology**	**Unit-1: The scope of food microbiology** • 1.1 Definition of microbiology, • 1.2 Important contributions of various scientists, • 1.3 Scope of microbiology, • 1.4 Factors affecting growth -food acidity, temperature, time, oxygen, moisture, • 1.5 Classification of microorganisms- Bacteria, yeast, mold, virus. •1.6 Importance of bacteria, yeast, and moulds in foods	9
Unit II	**Culture media and Pure culture Techniques**	• 2.1 Definition of Media, Components of Media • 2.2 Types of media: Natural, Synthetic, Semi-synthetic, Special, Selective and Differential media. • 2.3 Culture Media &; its Composition, Types of culture media depending upon composition, • 2.4 function &; applications and agar concentrations, • 2.5 Methods for isolation of pure culture- • 2.6 Streak plate, pour plate and Spread plate.	9
Unit III	**Food in relation to disease**	• 3.1 Food borne illness: Bacteria causing food borne diseases, food borne poisoning, • 3.2 infections and intoxications: nonbacterial-mycotoxin, Rickettsia, sea food toxicants, • 3.3 Characteristics of organism & Toxin, Food sources, Symptoms and prophylaxis.``	9

Unit- IV	**Stains and Staining Procedures of Bacteria**	• 4.1 Definition of dye and stains, classification of stains- Acidic, Basic and Neutral. • 4.2 Staining procedures: Principles and Procedure. • 4.3 Mechanism and applications of- Simple staining, Differential staining- Gram staining and Acid-fast staining. • 4.4 Mechanism and applications of Negative staining, Special staining differential staining- gram staining & acid-fast staining.	9
Unit - V	**Control of Microorganisms**	• 5.1 Sterilization-Physical methods- Temperature, Filtration, UV radiation and Osmotic pressure • 5.2 Chemical methods- Use of chemical agents for sterilization • 5.3 Definitions of Sterilization, Disinfection, Antiseptic, Germicide, • 5.4 Microbiostasis, Antisepsis, Sanitization. • 5.5 Mode of action, application and advantages of: Physical agents, Chemical Agents , Gaseous Agents	9

Reference Book:

1.Adams M.R. and Moss M.O. "Food Microbiology" Second edition

2.PurohitS.S."Microbiology fundamentals and applications" Edition,6. Publisher,Agrobios,2003.

4.Frazier, W.C.,and Westhoff,D.C.1988.FoodMicrobiology,4thed.McGraw-Hill,NewYork.

5.Jay,J.M.2000.ModernFoodMicrobiology.6thed.Chapman&Hall.NewYork,N.Y.

7.Fundamental principles of bacteriology by A. J.Salle, Tata Mcgraw hill.

Paper FST 15: Basic Principles of Food Preparation & Preservation (Practical Component)

Objectives:

1) The goal of food preservation is to increase the shelf life of a food while keeping it safe. It ultimately ensures its supply during times of scarcity and natural drought.

2) The main objectives of food preservation include lengthening lag phase of bacteria growth; delaying undesired autolysis; minimizing pest/ physical damage and preventing microbial action.

FST 15. Practical Paper I 04 credits (12 P x 5 Hours)

(**Content: Practical Component**)

Sr. No.	Content	No. of Practical (6 periods each)
1	Introduction and demonstration of machineries used in food processing	1
2	To study the effect of enzymatic browning in fruits and vegetables	1
3	To study effect of blanching on quality of foods	1
4	Preservation of food by canning and bottling	1
5	Cut-out analysis of canned food	1
6	Preservation of food by high concentration of sugar (preparation of jam)	1
7	Preservation of food by high concentration of salt and acid (preparation of pickle)	1
8	Drying and preservation of foods by freeze drying	1
9	Preservation of milk by pasteurization and sterilization	1
10	Drying and preservation of green leafy vegetables or fruit slices in cabinet dryer.	1
11	Preservation by osmotic dehydration of foods (preparation of candy)	1
12	Drying and preservation of foods by spray drying process	1
13	Preservation of foods by using chemicals (preparation of tomato ketchup)	1

14	Preservation of milk by condensation or concentration	1
15	Visit to any food processing industry or unit	1

References:

- Food Science By Potter
- Food Science 3 rd edition By B. Shrilakshmi
- Fruit & Vegetable Preservation By Srivastava Kumar
- Food, Facts and Principles By Shakuntala Manay
- Food Processing and Preservation By G. Subbulakshmi, Shobha A Udipi
- Food Processing Technology 2nd edition By P. J. Fellows
- FSSAI Manual

Paper FST 16: Basic Nutrition

Objectives:-

1) Fundamentals of Food and Nutrition" aims at developing basic understanding about nutrition, its effect on human health and newer advances in food technology.

(Practical Component)

FST 16. Practical Paper II 04 credits (12 P x 5 Hours)

(**Content**)

Sr.No.	Topic	No.of Practical (6 periods each)
1	Introduction of Basic Food Groups	1
2	Introduction of Food and their Nutrient Content	1
3	Non-Nutrient Components of Foods and their significance	1
4	Nutritional Deficiency Their Prevention and Controls	1
5	Effect of processing on Nutritive Value	1
6.	Introduction of Recommended Dietary Allowances (RDA)	

7	Meal planning	1
8	To Plan & Design Nutritional meal/ Food for Infant	1
9	To Plan & Design Nutritional meal/ Food for Adult	1
10.	To Plan & Design Nutritional meal/ Food for Old Age	1
11	Identify Sources & Functions of CHO, Proteins, Fat, Vitamin, Minerals,& Water In The Human Body.	1
12	Preparation of Vitamin A Rich Food	1
13	Preparation of Vitamin C Rich Food	1

References:

- Bamji MS, Krishnaswamy K, Brahmam GNV (2009). Textbook of Human Nutrition, 3rd
- edition. Oxford and IBH Publishing Co. Pvt. Ltd.
- Srilakshmi (2007). Food Science, 4th Edition. New Age International Ltd. 29
- Wardlaw MG, Paul M Insel Mosby (1996). Perspectives in Nutrition, Third Edition.
- B. Srilakshmi (2007) Dietetics, Revised Fifth Edition, New Age International Publishers
- B. Srilakshmi (2011) Nutrition Science, Third Edition, New Age International Publishers
- Dr. M. Swaminathan (2006) Advanced Text book on Food and Nutrition, Volume 1 and 2,
- Second Edition, BAPPCO Publication.

Paper FST 17: Food Microbiology

Objectives:-

1) studying the diversity and activity of microorganisms in their natural environment, their mutual interactions and their survival and adaptation strategies.

(Practical Component)

FST 17. Practical Paper III 04 credits (12 P x 5 Hours)

(**Content: Practical components**)

Sr. No.	Topic	No.of Practical (6 periods each)

1	Preparation of Standard Operating Procedures (SOPs) for common microbiology laboratory instruments e.g. Incubator, Hot Air Oven, Autoclave, Colorimeter, pH Meter, Distillation Unit, Chemical Balance, Laminar air flow hood, Clinical Centrifuge	1
2	Structure and working of light microscope	1
3	Study cell morphology with simple Staining - Monochrome, Negative	1
4	Differential staining : Gram staining	1
5	Special Staining: Capsule, Spore	1
6	Observation of motility in bacterial by Hanging drop method	1
7	Observation of motility in bacterial by Hanging drop method	1
8	Enumeration of yeast cells using a counting chamber	1
9	Preparation of culture media.	1
10	To sterilize the media and equipment.	1
11	Aseptic transfer techniques – types –Tube to tube, Tube to plate	1
12	Isolation of bacteria by streak plate, Observation of cultural characters	1
13	Culturing the bacteria on a solid media by using serial dilution method and determining the number of viable cells in the culture (standard plate count).	1

References:

- Food microbiology (IVth edition) - William C. Frazier and Dennis C. Westoff-
- Tata McGraw Hill Pub. Co. Ltd, New Delhi, 1995)
- Basic food Microbiology-George G. Banwart (CBS publishers & distributors, New Delhi,
- 1987)
- Food microbiology- M. R. Adams & M. O. Moss (New Age International (P). Ltd. 2000)
- Jay, James M. Modern Food Microbiology, CBS Publication, New Delhi, 2000
- Introduction to Microbiology, M.H. Gajbhiye & S.J. Sathe et al, Career Publications, Nashik, 2015

FST 18. Seminar 02 credits

Students are expected to perform give seminars on Various topics equivalent to 30 hours. It helps to improve oral & written communication skills & apply principals of ethics & respective interaction with others.

FST 19. On job Training 04 credit

Students are expected to visit at least one food based industry and one mall/market and give a detailed report of the same. Work carried out here should be equivalent to 60 hours.

Semester- II

Paper: FST 21 Food Microbiology-II (General Education Component)

Maximum Marks: 75 **Credits: 3**
Teaching Period: 3 /week **Teaching Load: 45 Theory Period/Semester**
.

Learning Objectives:

To enable the students to:

- Understand the various types of poisoning and infection caused by microorganism.
- Study various techniques used to study microorganisms.

Learning Outcomes:

Students should be able to:

- Explain the interactions between microorganisms and the food environment, and factors influencing their growth and survival.
- Explain the effects of fermentation in food production and how it influences the microbiological quality and status of the food product.

(**Content: General Paper-04**)

Unit	Topic	Details	No of Lectures
Unit-1	**Microbiology and Spoilage of food**	• 1.1 Factors influencing food spoilage – Intrinsic & Extrinsic factors. • 1.2 Contamination and spoilage of fruits and vegetables • 1.3 Contamination and Spoilage of cereal-cereal products. • 1.4 Contamination and Spoilage of meat, fish, poultry. • 1.5 Contamination and Spoilage of milk-milk products.	9
Unit II	**Food-Borne illness:** Bacterial and Non-bacterial	• 2.1 Food Borne Intoxications – Staphylococcal poisoning, Botulism • 2.2 Food Borne Infections – Salmonellosis, Shigellosis • 2.3 Food Borne Toxic Infections – Cholera, Listeriosis • 2.4 Mycotoxins – Aflatoxin, Patulin, Ochratoxin • 2.5 Food – Borne Parasites – Trichinosis • 2.6 Seafood Toxicants – Shellfish Poisoning, Scombroid Food Poisoning	9
Unit - III	**Food Fermentations**	• 3.1 Role of micro-organisms in fermentation • 3.2 Fermented Meat & Fish Products – Sausages, Fermented Fish • 3.3 Fermented Fruit & Vegetable Products – Sauerkraut, Kimchi, Vinegar, Citric acid • 3.4 Fermented Cereal Products – Idli, Vada, Dosa, Bhatura, Dhokla, Miso, Tempeh, Soy Sauce. • 3.5 Economically important fermented foods-Beer, Ale, Wine, Distilled Liquor Products.	10

Unit - IV	**Microbiology in Food Sanitation**	• 4.1 Bacteriology of Water • 4.2 Sewage & Waste Treatment & Disposal • 4.3 Microbiology of The Food Products • 4.4 Good Manufacturing Practices	9
Unit - V	**Foods & Enzymes from Microrganisms**	• 5.1 Microrganism as Food • 5.2 Single cell protein • 5.3 Fats from Microrganism • 5.4 Production of Enzymes- amylase, invertase, cellulose, glucose oxidase • 5.5 Production of Other substance- lactic acid, citric acid	9

Reference Book:

REFERENCES:

1. Microbiology by Dr M G Bodhankar, MrsTriptiBapat&MrsNivedita Joshi, PhadkePrakashan
2. Food microbiology by William Frazier
3. Textbook of Microbiology (6th edition) by Ananthnarayan& C K J Paniker
4. Basic Food Microbiology by George J. Banwart
5. Food Microbiology by M R Adams and M O Mos
6. Industrial microbiology L.E.Casida
7. Fundamental Food Microbiology- Bibek Ray &ArunBhunia
8. Biotechnology: Food Fermentation- Microbiology, Biochemistry and TechnologyV.K. Joshi & A. Pandey- Volume 1 & 2
9. Modern Food Microbiology – K. R. Anej

Paper FST 22: Food Chemistry

(General Education Component)

Maximum Marks: 75 **Credits: 3**
Teaching Period: 3 /week **Teaching Load: 45 Theory Period/Semester**

Learning Objective:

To enable students:

- Trained to understand and discuss the main principles, theories and concepts underlying established knowledge in **food chemistry**.
- Explain the major **chemical** reactions that occur during **food** handling, processing and storage, including those that limit **food** shelf life.

Learning Outcomes:

Students should be able to:

- Ability to use terminology, appropriate to the field of **food chemistry**, correctly and contextually. used in the future.
- Capacity to formulate **foods** that are designed to address and contribute to reducing community health concerns.

(**Content: General Paper-05**)

Unit	Topic	Details	No of Lectures
Unit-1	Introduction to food chemistry Water	• 1.1 Overview of Food Chemistry • 1.2 Definition of food chemistry • 1.3 Significance of food chemistry • 1.4 Water- Forms of water in food, • 1.5 Role of water in food • 1.6 Water Activity and relative vapour pressure, • 1.7 Water activity and storage of food, • 1.8 Water activity and packaging of food, • 1.9 Water activity and processing of food	06
Unit II	Carbohydrates	• 2.1 Definition, • 2.2 Sources, • 2.3 Classification - monosaccharides, oligosaccharides, polysaccharides, • 2.4 Gelation, • 2.5 Retrogradation, • 2.6 Dextrinisation, • 2.7 Types of Food Starches, • 2.8 Soluble Fibres- Pectins, Gums, Mucilages. • 2.9 Chemical reactions of carbohydrates: oxidation, reduction, osazone and ester formation, isomerization, • 2.10 Browning Reactions, Enzymatic and non-enzymatic browning reaction	09
Unit - III	Lipids	3.1 Lipids 3.2 Definition and nomenclature 3.3 Classification 3.4 Fatty acids, Triacylglycerols, Glycerophospholipids Chemical properties of fats and oil (hydrolysis, saponification value, acid value, iodine value, rancidity) 3.5 Biological significance of fats	07

Unit - IV	Proteins	• 4.1 Definitions of proteins and amino acids, sources • 4.2 Classification of amino acids, • 4.3 Physical and chemical properties of amino acids, Peptides • 4.4 Classification of proteins, structure of proteins, properties of proteins • 4.5 Reactions involved in food processing, Texturized protein • 4.6 Effect of processing on protein	08
Unit V	**Food Flavour& colours:**	Definition and basic tastes, • 5.1 Chemical structure and taste, Description of food • 5.2 flavours and Flavour enhancers • 5.3Food Colour (Pigments): • 5.4 Introduction and classification, Food pigments (chlorophyll, carotenoids, anthocyanins andflavonoids, beet pigments, caramel)	8

Reference Book:

Fennema, O.R. Ed. 1976. Principles of Food Science

2 Part-I Food Chemistry. Marcel Dekker, New York.

३. Potter, N.N. 1978. FoodScience. 3rd Ed. AVI, Westport.

4. Branen A.L. and Davidson, P.M. 1983. Antimicrobialsin Foods.Marcel Dekker, New York.

4. Furia, T.E. 1980. Handbook of food additives. Vol I and Vol II

Paper FST 23: Introduction to Food Science-II

(General Education Component)

Maximum Marks: 75 **Credits: 3**
Teaching Period: 3 /week **Teaching Load: 45 Theory Period/Semester**

.

Learning Objectives:

- To make students aware about various cooking methods, food groups, composition,

nutritive value and effect of cooking on foods.

Learning Outcomes:

The student will be able to:

- Know about the basic cookery and the nutritive value of food products
- Classify the products according to properties
- Explain role of each food group products

(**Content: General Paper-05**)

Unit	Topic	Details	No of Lectures
Unit-1	**Fruits**	• Introduction • Classification • Composition and Nutritive value • Ripening of fruits • Fruit Storage • Storage of fruits	9
Unit II	**Vegetables**	• Introduction • Classification • Composition and Nutritive value • Selection of fruits • Salads • Storage of vegetables Vegetables and fruits as functional foods	9
Unit - III	**Spices**	• Introduction • Classification • Composition • Major Spices & Minor spices Flavoring extracts • Adulteration of spices	9
Unit - IV	**Sugar and Related products**	• Nutritive value • Properties • Sugar related products • Sugar cookery • Artificial sweeteners	9
Unit V	**Effect of Processing**	• Effect of processing on Physical properties of food • Effect of processing on sensory properties of food • Effect of processing on nutritional properties of food	9

References

1. Food Facts & Principles – N. ShakuntalaManay, M. Shadaksharswamy
2. Food Science –B. Srilakshmi
3. Food Science - Potter
4. Food Science- Sumati R. Mudambi
5. Food Facts and Principles - ShakuntalaManay
6. Food Processing and Preservation - G. Subbulakshmi, Shobha A Udipi
7. Food Processing Technology - P.J.Fellows.

Paper FST 24: Food Adulteration & Additives

(General Education Component)

Maximum Marks: 75 **Credits: 3**
Teaching Period: 3 /week **Teaching Load: 45 Theory Period/Semester**

.

Learning Objectives:

- To provide theoretical basis of adulteration test of food products and learn adulteration testing methods of food through hands-on experience.
- To provide knowledge latest analysis techniques, instruments and methods to analyzed food samples

Learning Outcomes:

- Develops analytical skill on testing adulteration in foods and interpretation of the data.

(**Content: General Paper-05**)

Unit	Topic	Details	No of Lectures
Unit-1	**Introduction to Food adulteration,**	• Definition of Food Adulteration • Types of adulterants, • Common adulterants in foods, • toxicants in foods, • Impact of food adulteration in humans.	9
Unit II	**Prevention of food adulteration**	• Improved Storage facilities • Improved Handling practices • Prevention of Addition of extraneous matter • Introduction of newer technologies for detection of food adulteration	9
Unit - III	**Food Additives**	• Definition of Food Additives • Role of food additives, • Different Food Additives antioxidants, chelating agents, coloringagents, curing agents, emulsifiers, flavor enhancers, flavor improvers, humectants and anti-caking agents, leavening agents, stabilizers and thickeners, food fortifiers.	9
Unit - IV	**Food Laws**	PFA and Adulteration of milk, FPO, MFPO, BIS, AGMARK., The importance and the needs of ethics; Ethical business practices; Laws and ethics; Environmental protection; Creating awareness and safeguarding health of consumers; Fair trade practices, Powers of food inspector	9

References

1. Food Facts & Principles – N. ShakuntalaManay, M. Shadaksharswamy
2. Food Science –B. Srilakshmi
3. Food Science - Potter
4. Food Science- Sumati R. Mudambi
5. Food Facts and Principles - ShakuntalaManay
6. Food Processing and Preservation - G. Subbulakshmi, Shobha A Udipi
7. Food Processing Technology - P.J.Fellows.

Paper FST 25: Food Chemistry

Objectives

FST 25. Practical Paper IV 04 credits (12 P x 5 Hours)

Sr.No.	Topic	No.of Practical
1	Preparation of primary and secondary solutions	1P
2	Determination of gelatinization temperature range (GTR) of different starches	1P
3	Determination of refractive index and specific gravity of fats and oils	1P
4	Determination of smoke point and percent fat absorption for different fat and oils	1P
5	Determination of percent free fatty acids	1P
6	Estimation of saponification value of fat or oil.	1P
7	Estimation of reducing and non-reducing sugars	1P
8	Phenol sulphuric acid test for carbohydrates	1P
9	Estimation of starch by anthrone reagent	1P
10	Estimation of total ash from food sample	1P
11	Estimation of minerals	1P

12	Estimation of iodine value of Oil	1P
13	Estimation of peroxide value of fat or oil	1P
14	Determination of carotenoids with respect to flour pigments	1P
15	Estimation of Moisture from food sample	1P
16	Determination of protein by Biuret method	1P
17	Estimation of Fibre from food sample	1P

Paper FST 26: Food Adulteration

FST 26. Practical Paper V 04 credits (12 P x 5 Hours)

Objective: The basic object of this paper is to help students to acquire the knowledge of Chemistry of foods.

Sr. No.	Topic	No. of Practical
1	Detection of Starch in Milk.	1P
2	Detection of yellow dye in Turmeric Powder.	1P
3	Detection of water in milk.	1P
4	Detection of washing soda chalk powder insoluble substance in sugar.	1P
5	Detection of sugar solution in honey.	1P
6	Detection of Brick Powder in chilli powder.	1P
7	Detection of Kesari dal in red Gram.	1P
8	Detection of Chalk powder in Salt.	1P
9	Detection of iron flakes in tea & coffee.	1P

10	Detection of artificial colour in green peas .	1P
11	Detection of Starch in Khoa products	1P
12	Detection of Vanaspati/margarine in ghee	1P
13	Detection of prohibited colour in edible oil.	1P
14	Detection of other oil in coconut oil.	1P
15	Detection of washing soda in jaggery	1P
16	Detection of papaya seeds in Black pepper	1P

Paper FST 27: Food Science

(Practical Component)

FST 27. Practical Paper VI 04 credits (12 P x 5 Hours)

(**Content: Practical components**)

Sr. No.	Topic	No. of Practical
1	To study the gelatinization temperature range and % sag of various cereal starches.	1P
2	Detection of gluten in various foods.	1P
3	To study factors affecting gelatinization of cereals starches	1P
4	Study of germination of whole pulses and legumes.	1P
5	Effect of kneading on gluten development in Chapati	1P
6.	Effect of Ratio of water on cooking quality of rice	1P
7	To perform the recognition test for four basic tastes	1P
8	To recognize few odors and to learn to memorize them.	1P

9	Identification pigments in fruits and vegetables and influence of PH on them.	1P
10.	Effect of Ratio of water on cooking quality of husked & dehusked Pulses	1P
11	Demonstration of food laboratory instruments: Autoclave, Hot air oven, Incubator, Ph-meter, Centrifuge, Calorimeter/ spectrophotometer, laminar air flow	1P
12	Demonstration of cereals, pulses and oil crops.	1P
13	Demonstration of Fruits and vegetables.	1P
14	Demonstration of condiments and Spices.	1P
15	Food industry visit and report.	1P

FST 28. Seminar 02 credits

Students are expected to perform give seminars on Various topics equivalent to 30 hours. It helps to improve oral & written communication skills & apply principals of ethics & respective interaction with others.

FST 29. On job Training 04 credit

Students are expected to visit at least one food based industry and one mall/market and give a detailed report of the same. Work carried out here should be equivalent to 60 hours.